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# Remarks/Arguments

Referring to the office action, affirmation of the election of Group I is hereby made.

Claims 1-5 are presently pending in this application; claims 6-18 have been withdrawn; claims 2, 3 and the extra claim 2 have been canceled; and new claims 19, 20 and 21 have been added.

In the office action, claims 2 and 3 were objected under 37 CFR 1.75(c) as being of improper dependent form to further limit the subject of a previous claim. Since these claims were canceled, issues pertaining thereto are moot.

In reference to the extra claim 2, since the claim has also been canceled, issues pertaining thereto are moot.

Claims 1 -5 were rejected on the second paragraph of 35 USC 112 as being indefinite since the terms "transparent" in claim 1, "exaggerated size" also in claim 1, and "average-sized grain" in claims 2 and 3, are relative terms and should be defined. It is believed that this objection has been overcome by introducing subject matter of claims 2 and 3 into claim 1 and the term "average sized grain" can be ascertained by a person skilled in the art. As noted at bottom of p.6 of this specification, the term "exaggerated grain growth" typically leads to grains that are greater than 3 times larger to several orders of magnitude larger than the average sized grains. So, under a microscope, a grain of exaggerated size

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can be easily detected, especially in view of the fact that spinel product grains are within about 300 % of the average-sized grain.

Claims 1 - 5 were rejected under 35 USC 102(b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over the Sellers reference. The Examiner contends that the Sellers reference discloses the use of spinel of extremely small particle size of well under one micron, noting col. 2, lines 60-67, and concludes that Sellers spinel product is devoid of grains larger than about 1 mm, and is devoid of grains of exaggerated size. At bottom of col. 2, in lines 60-67 of the Sellers reference, it is disclosed that powder size is well under one micron, however, this disclosure pertains to the powder particle size and not to the grain size of the product. In fact, it does not appear that the Sellers reference discloses any product grain size at all. Furthermore, the Examiner makes an unsubstantiated statement that Sellers product is devoid of grains of exaggerated size, defined at bottom of p. 6 of this specification as being greater than 3 times larger to several orders of magnitude larger than an average-sized grain.

The Examiner also contends that the LiF is uniformly mixed and that after sintering, the LiF sintering aid would vaporize. First of all, as used herein, the prior art "uniform mixing," as represented by the Sellers reference, is not the same "uniform mixing" as herein disclosed since herein, LiF is dissolved to form

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a sintering aid solution which is used to uniformly coat the powder particles and thus attain a level of uniform mixing not attained by the prior art physical mixing, nor known at that time. Secondly, the Sellers reference wants LiF to remain whereas here, claim 1 unequivocally recites that the claimed product is devoid of the sintering aid. In the Sellers reference, at about the middle of col. 3, it is expressly disclosed that to ensure against total loss of LiF, heating thereof be curtailed to less than 30 minutes. To promote transparency, LiF should be removed since, otherwise, it will negatively impact it. This conclusion is based on consideration of the issue since maximizing index of refraction difference of materials increases light scattering and thus, transparency. The conclusion is self-apparent since index of refraction of a spinel material is about 1.7, that of LiF is about 1.5 and that of air is 1. Therefore, it should be apparent that LiF, or another sintering aid, should be removed from the product in order to enhance its transparency. This is confirmed, inter alia, by Fig. 3, herein, wherein the prior art product #1 is shown as having significantly reduced transmission.

Returning to the recitation "product essentially devoid of a sintering aid," to which the Examiner has objected to as being indefinite, the Examiner's attention is directed to the top of p. 12 of the specification where the recitation is discussed. Review

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of the disclosure at top of p. 12 of the specification, leads one skilled in this art to the inescapable conclusion that the product contains no sintering aid. This conclusion is further supported by the fact that preparation of the product includes a half-hour hold at 1200°C for the vaporized sintering aid to leave the hot press and then another 20°C/minute ramp to about 1550°C , temperatures that are too high for the sintering aid to remain in the product.

The Examiner has no basis for assuming that porosity of Sellers product is 0.2% or less since it is believed to be higher and is not dispositive of the issue since porosity can be low when the pores are plugged, as with a sintering aid.

The comments that follow are comments by the inventors herein and are being presented in the interest of clarifying the invention claimed herein. With respect to the issue of particles v. grains, it is unfortunate that in common usage, a "particle" can be referred as a "grain," as in a grain of sand. This leads to confusion when there is interaction between those skilled in the art of materials science and those not skilled in the art. To one of ordinary skill in the art, the terms "particle" and "grain" refer to two distinct and non-interchangeable entities. A "particle" is the basic easily divisible part of a powder while a "grain" is a subunit of a densified body possessing in its entirety a crystal structure with a locally unique direction. Drafter(s)

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of the Sellers reference, being of more than ordinary skill in the art, would not confuse the two designations. The Sellers reference mentions sub micron particle size in: the abstract; col.1, lines 34-35; col.1, line 61; col.1, lines 67-68; col.2, line 15; col.2, line 62; and in col.4, line 50. In all cases, the Sellers reference is referring to the size of the starting powder particle size. Careful reading of the supporting material in the Sellers reference confirms that the Sellers reference has not mixed up the designations. The Sellers reference makes no claim as to the final grain size of its spinel.

With respect to grain size as a function of particle size, it should be noted that to one of ordinary skill in the art, the starting particle size of the powder has very little to do with the final grain size of the densified shape. The final grain size is a function of the temperature, time at that temperature, intermediate holds, pressure application schedule, reactivity of the starting powder, composition variations in the starting powder, amount and type of additives and impurities, surrounding atmosphere, outgassing dynamics, and a host of other effects that are easily categorized. It is common, to the point of being an indisputable rule, that two identical powders of identical initial size and distribution, will not have the same final grain size unless identical procedures are followed.

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The above discussion is for a powder that does not need a sintering aid. If sintering aids are needed for densification, one of ordinary skill in the art knows that identical grain size, distribution or even degree of densification, is unlikely even following the identical procedure, due to inhomogeneous mixing of the sintering aid on a microscopic scale, even though everyone calls it uniformly mixed. This is the reason that even after 40 years, it is not yet a commercially viable product. In fact, the Sellers reference procedure actually leads to large sized grains, not sub-micron, as the Examiner concludes, and furthermore, there is considerable exaggerated grain growth.

With respect to mixing of sintering aid with powders, the Sellers reference mentions "uniformly mixed" lithium fluoride in: the abstract; col.1, line 35; col.3, line 1; and in col.4, line 26. One of ordinary skill in the art knows that it is not possible to mix a particulate sintering aid with a powder so that all particles are in contact with the sintering aid - this is geometrically impossible because sintering aids are typically added in quantities below 5 weight percent. To further complicate matters, at the sub-micron particle sizes typically used, Van der Waals forces tend to attract and agglomerate the particles together creating segregation regions that are rich in either the powder or sintering aid, thereby making an even distribution more difficult. Sellers powder

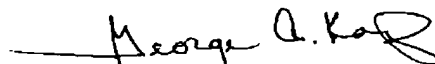
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was mixed with the sintering aid in the traditional sense, but not uniformly on a microscopic scale. Since a "uniform" mixture is not completely homogeneous and creates areas of differential densification that we are able to overcome with our invention.

New claims 19, 20 and 21, are on the spinel product itself. Please charge our account #50-0281 for the new claims, if applicable.

Reconsideration and allowance of claims 1, 4, 5, 19, 20 and 21 is requested since the claims are unobvious over the Sellers reference.

Sincerely,

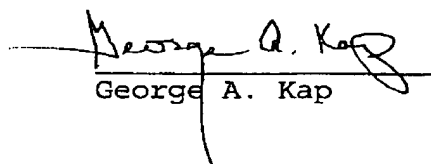


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Fax Certification

I hereby certify that this document is being faxed to the PTO on the date shown below:

Jan. 7, 2005  
Date



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